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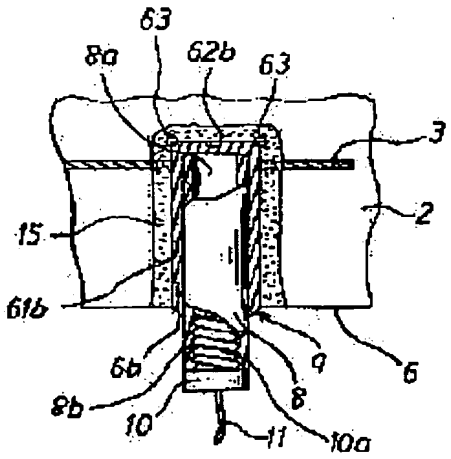
(54) POWER FEEDING STRUCTURE FOR WAFER HOLDER

(57)Abstract:
PROBLEM TO BE SOLVED: To protect a ceramic board against damage when a feeding terminal is fixed by brazing by a method wherein a fixing hole is bored penetrating through a heater electrode, a metallized layer is formed on the inner wall of the fixing hole, and the feeding terminal is joined to the side wall or base of the fixing hole by brazing.
SOLUTION: A fixing hole 6b for mounting a feeding terminal 8 is bored in the rear 6 of a ceramic board penetrating through a heater electrode, and a metallized layer 15 is formed on the side wall 61b and base 62b of the fixing hole 6b which includes 8 suction electrode 3. Brazing material 9 is applied onto the side wall 61b of the fixing hole 6b, and the feeding terminal 8 is inserted into the fixing hole 6b and fixed by heating carried out at a prescribed temperature. As mentioned above, the hollow feeding terminal 8 is fixed to only the side wall 61b by brazing without being brazed to the base 62b so as to be lessened in brazing area, whereby stress induced in the feeding terminal 8 in the direction vertical to the axial direction of the terminal 8 is relaxed, so that stress is restrained from concentrating on a corner 63.



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POWER FEEDING STRUCTURE FOR WAFER HOLDER

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Inventor:	NAGASAKI KOICHI
Applicant:	KYOCERA CORP
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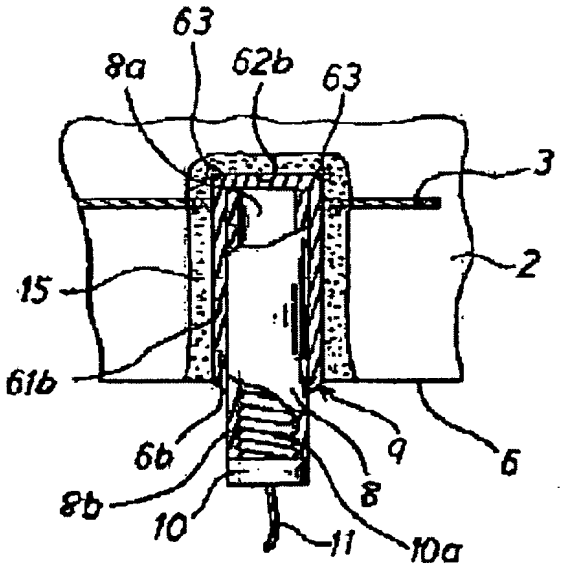
Abstract of **JP10189696**

PROBLEM TO BE SOLVED: To protect a ceramic board against damage when a feeding terminal is fixed by brazing by a method wherein a fixing hole is bored penetrating through a heater electrode, a metallized layer is formed on the inner wall of the fixing hole, and the feeding terminal is joined to the side wall or base of the fixing hole by brazing. SOLUTION: A fixing hole 6b for mounting a feeding terminal 8 is bored in the rear 6 of a ceramic board penetrating through a heater electrode, and a metallized layer 15 is formed on the side wall 61b and base 62b of the fixing hole 6b which includes 8 suction electrode 3. Brazing material 9 is applied onto the side wall 61b of the fixing hole 6b, and the feeding terminal 8 is inserted into the fixing hole 6b and fixed by heating carried out at a prescribed temperature. As mentioned above, the hollow feeding terminal 8 is fixed to only the side wall 61b by brazing without being brazed to the base 62b so as to be lessened in brazing area, whereby stress induced in the feeding terminal 8 in the direction vertical to the axial direction of the terminal 8 is relaxed, so that stress is restrained from concentrating on a corner 63.



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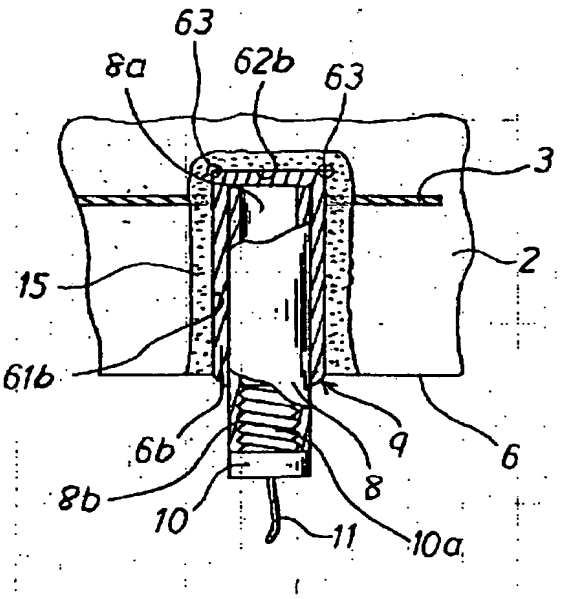
(54)【発明の名称】　ウエハ保持装置の給電構造

(57)【要約】
【課題】静電チャックやサセプタなどのセラミックスからなるウエハ保持装置内に内蔵する吸着用電極、ヒータ電極、高周波発生用電極への給電端子のロウ付け固定時や加熱、冷却の繰り返しにおいてウエハ保持装置の破損を防止する。
【解決手段】セラミック基体の上面を保持面とし、内部に吸着用電極、ヒータ電極、高周波発生用電極などの内部電極を備えてなるウエハ保持装置の給電構造として、上記セラミック基体の裏面に給電端子を取り付けるための固定孔を前記電極を貫通して穿設し、その内壁にメタライズ層を形成するとともに、上記固定孔の内壁の側壁面又は底面のいずれか一方のみにロウ付けでもって給電端子を接合する。



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【特許請求の範囲】
【請求項１】セラミック基体の上面を保持面とし、内部に少なくとも一つの電極を備えてなるウエハ保持装置において、上記セラミック基体の裏面に給電端子を取り付けるための固定孔を前記電極を貫通して穿設し、その内壁にメタライズ層を形成するとともに、上記固定孔の内壁の側壁面又は底面のいずれか一方と給電端子をロウ付け固定してなるウエハ保持装置の給電構造。
【請求項２】上記給電端子が中空構造をしたものである請求項１に記載のウエハ保持装置の給電構造。
【請求項３】上記セラミック基体の内部に備える電極が、吸着用電極、ヒータ電極、高周波発生用電極のいずれかである請求項１に記載のウエハ保持装置の給電構造。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、半導体ウエハなどのウエハを保持する静電チャックやヒータ内蔵型サセプタなど、セラミック基体の内部に吸着用電極やヒータ電極、あるいは高周波発生用電極を備えるウエハ保持装置の給電構造に関するものである。
【０００２】
【従来の技術】従来、半導体装置の製造工程においては、半導体ウエハ（以下、ウエハと略称する）を高精度に保持するために静電チャックやヒータ内蔵型サセプタなどのウエハ保持装置が使用されている。
【０００３】例えば、図５に静電チャック５１の縦断面図を示すように、セラミック基体５２の上面を保持面５５とし、内部の上方に吸着用電極５３を、下方にヒータ電極５４をそれぞれ埋設したものがあった。そして、上記静電チャック５１の保持面５５にウエハ５０を載置し、ウエハ５０と吸着用電極５３との間に電圧を印加することで、誘電分極によるクーロン力や微小な漏れ電流によるジョンソン・ラーベック力を発現させてウエハ５０を保持面５５に吸着保持するとともに、ヒータ電極５４に通電することによりウエハ５０を加熱するようになっていた。
【０００４】また、上記セラミック基体５２に埋設する吸着用電極５３やヒータ電極５４などの内部電極への給電構造は、セラミック基体５２の裏面５６に給電端子５７，５８を取り付けるための固定孔５６ａ，５６ｂを前記内部電極５３，５４と連通するように穿設し、該固定孔５６ａ，５６ｂの側壁面にメタライズ層５９を形成したあと、外径が３～１０ｍｍ程度の給電端子５７，５８を挿入し、固定孔５６ａ，５６ｂ及び内部電極５３，５４とロウ付け固定することにより導通をとるようにしたものがあった。
【０００５】
【発明が解決しようとする課題】ところが、前述のような給電構造をもった静電チャック５１では次のような課題があった。

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【０００６】給電端子５７，５８をロウ付け固定する場合、９００℃程度の高温に加熱しなければならないことから、大きな断面積を有する給電端子５７，５８をセラミック基体５２の固定孔５６ａ，５６ｂにロウ付け固定すると、給電端子５７，５８とセラミック基体５２との間の熱膨張差に起因して接合部分に歪みが残留し、十分な設計、検証がなされていないとセラミック基体５２が破損する恐れがあった。
【０００７】しかも、セラミック基板５２に埋設する内部電極５３，５４は厚みが数μｍから数十μｍと極めて薄い金属膜であることから、内部電極５３，５４に直接接合した給電端子５７，５８に数アンペアから数十アンペアもの電流を印加しながら加熱および冷却を繰り返すと、繰り返し疲労により内部電極５３，５４の断線を生じるといった課題があった。特に、セラミック基体５２を金属との熱膨張差が大きく、かつ他のセラミックスに比べて機械的強度が若干劣る窒化アルミニウムにより形成したものでは、これらの問題は顕著であった。
【０００８】また、内部電極５３，５４への他に給電構造として、内部電極５３，５４と給電端子５７，５８とをかしめ圧着したり、給電端子５７，５８を焼き嵌めにより固定する方法も提案されている（特開平４－１０４４９４号公報参照）が、かしめ圧着や焼き嵌めでは、製作上のばらつきが大きく信頼性に欠けるものであった。
【０００９】その上、静電チャック５１を高温に加熱するためにはヒータ電極５４に大電流を印加する必要があり、そのためには断面積の大きな給電端子５８を接合しなければならず、接合部分における熱応力が益々増大し、破損の危険が高いものであった。
【００１０】
【課題を解決するための手段】そこで、本発明は上記課題に鑑み、セラミック基体の上面を保持面とし、内部に吸着用電極、ヒータ電極、高周波発生用電極の少なくとも一つの電極を備えてなるウエハ保持装置の給電構造として、上記セラミック基体の裏面に給電端子を取り付けるための固定孔を前記電極を貫通して穿設し、その内壁にメタライズ層を形成するとともに、上記固定孔の内壁の側壁面又は底面のいずれか一方と給電端子をロウ付け固定したものである。
【００１１】
【発明の実施の形態】以下、本発明の実施形態について説明する。
【００１２】図１（ａ）は本発明に係る給電構造を有するウエハ保持装置の一例である静電チャック１を示す斜視図、（ｂ）は（ａ）のＸ－Ｘ線断面図であり、セラミック基体２の上面を保持面５とするとともに、内部の上方に吸着用電極３を、下方にヒータ電極４をそれぞれ埋設してあり、セラミック基体２の裏面６には上記吸着用電極３及びヒータ電極４にそれぞれ通電するための給電

端子７，８を固定してある。

【００１３】そして、上記静電チャック１の保持面５に半導体ウエハ５０（以下、ウエハと略称する）を載置し、上記吸着用電極３との間に電圧を印加することで誘電分極によるクーロン力や微小な漏れ電流によるジョンソン・ラーベック力を発現させ、ウエハ５０を保持面５の平坦精度にならわせて吸着保持させるとともに、ヒータ電極４に電圧を印加することで、ウエハ５０を均一に加熱するようにしてある。

【００１４】このような静電チャック１を構成するセラミック基体２としては、アルミナ、窒化アルミニウム、窒化珪素、炭化珪素、チタン酸バリウム、チタン酸カルシウム、イットリウム－アルミニウム－ガーネット、イットリアなどのセラミックスを採用すれば良い。この中でも特に窒化アルミニウムは、セラミックスの中でも高い熱伝導率を有することから、保持面５に吸着保持したウエハ５０を所望の温度に直ちに加熱し、加熱ムラを生じることなく均一に加熱することができるとともに、成膜工程やエッチング工程で使用されているハロゲン系腐食性ガスに対して優れた耐蝕性を有することから、静電チャック１を構成するのに好適である。

【００１５】なお、上記静電チャック１の保持面５は、ウエハ５０を歪ませることなく吸着保持するために平坦度が１０μｍ以下の極めて平坦な面に仕上げてある。

【００１６】ところで、セラミック基体２に埋設する吸着用電極３やヒータ電極４などの内部電極への給電構造としては、セラミック基体２の裏面６に給電端子７，８を取り付けるための固定孔６ａ，６ｂを前記内部電極３，４を貫通して穿設するとともに、給電端子７，８を固定孔６ａ，６ｂの内壁の側壁面又は底面のいずれか一方とロウ付け固定すれば良い。

【００１７】以下、内部電極３，４への給電構造の詳細について、ヒータ電極４への給電構造を例にとって説明する。

【００１８】図２は、図１のＡ部を示す拡大図であり、セラミック基体２の裏面６に給電端子８を取り付けるための固定孔６ｂをヒータ電極４を貫通して穿設するとともに、上記吸着用電極３を含む固定孔６ｂの側壁面６１ｂ及び底面６２ｂにメタライズ層１５を形成してある。なお、メタライズ層１５の層厚みとしては数十μｍ程度あれば良い。

【００１９】そして、上記固定孔６ｂの側壁面６１ｂにロウ材９を塗布しつつ給電端子８を挿入し、所定の高温雰囲気で加熱することでロウ付け固定するのであるが、上記給電端子８は内部に内孔８ａを持った中空構造の給電端子８を固定したものである。

【００２０】即ち、給電端子８をロウ付け固定するには９００℃程度の高温で加熱する必要があることから、内孔を有していない中実構造の給電端子８を用いると給電端子８の軸方向ならびに軸に対して垂直な方向におけるセラミック基体２との間の熱膨張差が大きすぎるために、固定孔６ｂのコーナー部６３に応力が集中してクラックが発生するのであるが、本発明は、中空構造の給電端子８を用いて固定孔６ｂの側壁面６１ｂとのみロウ付け固定し、底面６２ｂとのロウ付け面積を減らしてあることから、給電端子８の軸方向と垂直な方向の応力を緩和して固定孔６ｂのコーナー部６３における応力集中を抑制するとともに、固定孔６ｂの側壁面６１ｂにはメタライズ層１５を形成してロウ材９が分散し易くしてあるため、熱膨張差に伴う応力を吸収してセラミック基体２の破損を防止することができる。

【００２１】しかも、給電端子８を固定する固定孔６ｂは薄肉のヒータ電極４を貫通して穿設し、かつ上記ヒータ電極４を含む固定孔６ｂの側壁面６１ｂにメタライズ層１５を形成してヒータ電極４と導通がとれるようにしてあることから、静電チャック１を高温に加熱するために大きな電圧を印加してもヒータ電極４の断線を生じることなく確実に通電することができる。

【００２２】このように、本発明によれば、固定孔６ｂをヒータ電極４を貫通して形成し、その側壁面６１ｂ及び底面６２ｂにメタライズ層１５を形成するとともに、中空構造の給電端子８をロウ付け固定して、固定孔６ｂの側壁面６１ｂとのみロウ付け固定する構造としてあることから、ロウ付け固定時における加熱においてセラミック基体２を破損することがなく、また、ヒータ電極４への通電による加熱、冷却の繰り返しにおいてもヒータ電極４の断線及びセラミック基体２の破損を生じることがない。

【００２３】ところで、中空構造の給電端子８とは、図３（ａ）～（ｃ）に示すような、断面形状が円形や楕円形をしたもの、あるいは四角形などの多角形をした内孔８ａを有するものなど、少なくとも給電端子８の先端部に内孔８ａを有するものであれば良く、必ずしも貫通している必要はない。さらに、図３（ｄ）に示すように、円筒状をした給電端子８にスリット８１を設けることでさらに応力を緩和することができる。また、給電端子８の外形状においても円筒状をしたものだけに限らず、楕円や角柱をしたものであっても構わない。

【００２４】なお、給電端子８の好ましい寸法としては、内径ｄに対する最大外径Ｄの割合が２以下の範囲にあるものが良い。

【００２５】これは、内径ｄに対する外径Ｄの割合が２より大きくなると、給電端子８の先端部における肉厚が厚くなりすぎるために、固定孔６ｂのコーナー部６３に発生する応力を充分に吸収することができなくなるからである。

【００２６】ただし、給電端子８の内径ｄとは内孔８ａの最も短い部分の長さのことであり、外径Ｄとは外周部において最も長い部分の長さのことである。

【００２７】さらに、セラミック基体２の裏面６と給電

端子８との間に逆Ｒ状のメニスカスを形成すれば、熱膨張差に起因する応力集中をさらに吸収することができる。

【００２８】なお、上記給電端子８とリード線１１の接続は、図２に示すように、給電端子８の内孔８ａの後端部に雌ネジ部８ｂを設け、該雌ネジ部８ｂにリード線１１を接続した雄ネジ１０ａをもった取付金具１０を螺合して通電すれば良く、また、リード線１１を給電端子８の内孔８ａに直接接合しても良い。

【００２９】次に、ヒータ電極４への他の給電構造を説明する。

【００３０】図４は図２と同様にヒータ電極４への他の給電構造を示す拡大図であり、セラミック基体２の裏面６に給電端子８を取り付けるための固定孔６ｂをヒータ電極４を貫通して穿設するとともに、上記ヒータ電極４を含む固定孔６ｂの側壁面６１ｂ及び底面６２ｂにメタライズ層１５を形成してある。なお、メタライズ層１５の層厚みとしては数十μｍ程度あれば良い。

【００３１】そして、上記固定孔６ｂの底面６２ｂにのみロウ材９を塗布して給電端子８をロウ付け固定したものである。

【００３２】このように、給電端子８の先端面と固定孔６ｂの底面６２ｂにのみロウ付け固定すれば、熱膨張差に伴う給電端子８の軸方向の応力が皆無となるために、固定孔６ｂのコーナー部６３における応力集中を抑制し、セラミック基体２の破損を防ぐことができる。

【００３３】しかも、給電端子８を固定する固定孔６ｂは薄肉のヒータ電極４を貫通して穿設するとともに、上記ヒータ電極４を含む固定孔６ｂの側壁面６１ｂ及び底面６２ｂにはメタライズ層１５を形成してヒータ電極４と導通がとれるようにしてあることから、静電チャック１を高温に加熱するために大きな電圧を印加してもヒータ電極４の断線を生じることなく確実に通電することができる。

【００３４】なお、このような構造とすれば、給電端子８は中空構造だけに限らず図４に示すように中実構造のものであっても構わない。また、上記給電端子８とリード線１１の接続は、図４に示すように、給電端子８の雄ネジ８ｃと、リード線１１を接合した円筒状の取付金具１０の内孔１０ｂに形成する雌ネジ１０ｃとを螺合して導通をとるようにすれば良い。

【００３５】また、図４では、給電端子８の先端面と固定孔６ｂの底面６２ｂにのみロウ付け固定した例を示したが、逆に、給電端子８の外周面と固定孔６ｂの側壁面６１ｂにのみロウ付け固定しても良く、この場合、熱膨張差に伴う給電端子８の軸方向に対して垂直な方向の応力が皆無となるために、図４に示す給電構造と同様に固定孔６ｂのコーナー部６３における応力集中を抑制してセラミック基体２の破損を防ぐことができる。

【００３６】これら図２及び図４に示す給電構造のように、固定孔６ｂをヒータ電極４を貫通して穿設し、その側壁面６１ｂ及び底面６２ｂにメタライズ層１５を形成したあと、上記側壁面６１ｂ又は底面６２ｂのいずれか一方のみに給電端子８をロウ付け固定する構造とすれば、接合時及び使用時においてセラミック基体２の破損及びヒータ電極４の断線を生じることがない。

【００３７】ただし、固定孔６ｂに形成するメタライズ層１５は少なくとも側壁面６１ｂに形成してあれば良く、底面６２ｂに給電端子８をロウ付けする場合には、底面６２ｂにもメタライズ層１５を形成すれば良い。

【００３８】なお、本発明に係る給電構造において、ヒータ電極４に通電するための給電端子８の材質としては、高い耐熱性を有するとともに、セラミック基体２の熱膨張係数に近似したものが良く、例えば、タングステン、モリブデン、タンタル、コバールなどの金属により形成すれば良い。これらの金属は５００℃程度の高温下でも使用可能であるとともに、熱膨張係数が３×１０$^{-6}$～７×１０$^{-6}$／℃とセラミック基体２の熱膨張係数（３×１０$^{-6}$～７．８×１０$^{-6}$／℃）と近似していることから、セラミック基体２に加わる応力を軽減することができる。

【００３９】また、図２又は図４においてはヒータ電極４への給電構造を例にとって説明したが、図１の静電チャック１における吸着用電極３への給電構造も同様の構造としてあり、給電端子７の接合時は勿論のこと、大きく吸着力を得るために吸着用電極３に大きな電圧を印加してもセラミック基体２の破損及び吸着用電極３の断線を生じることがない。

【００４０】さらに、図１にはセラミック基体２の内部に吸着用電極３とヒータ電極４を埋設した例を示したが、さらに、高周波発生用電極を埋設しても良く、この電極への給電構造も図２に示すヒータ電極４と同様の給電構造を用いれば良い。

【００４１】以上のように、図１では静電チャック１を例にとって説明したが、本発明はヒータ電極や高周波発生用電極を内蔵したサセプタなど、セラミック基体２の内部に電極を内蔵するウエハ保持装置にも適用できることは言うまでもない。

【００４２】

【実施例】

（実施例１）ここで、図２及び図４に示す本発明の給電構造を用いた図１の静電チャック１と、従来の給電構造を用いた図５の静電チャック５１を試作し、給電端子７，８，５７，５８の接合実験を行った。

【００４３】本実験で使用する静電チャック１，５１は、まず、平均粒子径が１．２μｍ程度である純度９９．９％のＡｌＮ粉末にバインダーと溶媒のみを添加混合して泥漿を製作し、ドクターブレード法により厚さ０．４ｍｍ程度のグリーンシートを複数枚成形した。このうち２枚のグリーンシートにＡｌＮ粉末を混ぜたタン

グステン（W）のペーストをスクリーン印刷機でもって敷設して吸着用電極３，５３をなす金属ペースト膜とヒータ電極４，５４をなす金属ペースト膜をそれぞれに形成した。そして、各金属ペースト膜を敷設したグリーンシートと残りのグリーンシートを積層して８０°Ｃ、５０ｋｇ／ｃｍ² の圧力で熱圧着してグリーンシート積層体を形成したあと切削加工を施して円板状とし、該円板状のグリーンシート積層体を真空脱脂し、しかるのち、真空雰囲気にて２０００℃程度の温度で５時間焼成して、外径２００ｍｍ、肉厚１０ｍｍで、かつ内部に膜厚１５μｍ程度の吸着用電極３，５３とヒータ電極４，５４をそれぞれ備えるセラミック基体２，５２を形成し、吸着用電極３，５３が埋設されている側のセラミック基体２，５２の表面に研磨加工を施して保持面５を形成することにより製作した。

【００４４】そして、本発明のものとして、静電チャック１の裏面６に前記吸着用電極３及びヒータ電極４を貫通する固定孔６ａ，６ｂをそれぞれ穿設し、この側壁面６１ｂ及び底面６２ｂにメタライズ層１５を形成したあと、図２及び図４の給電構造を用いてモリブデンからなる給電端子７，８をロウ付け固定し、比較例として、静電チャック５１の裏面５６に給電端子５７，５８を取り付けるための固定孔５６ａ，５６ｂを前記内部電極５３，５４を貫通することなく連通するように穿設し、該固定孔５６ａ，５６ｂの側壁面にメタライズ層５９を形成したあと、モリブデンからなる給電端子７，８をロウ付け固定した。

【００４５】なお、給電端子７，８の寸法はいずれも外径Ｄ１０ｍｍの円柱状をしたものを使用し、図２の給電構造に用いる給電端子７，８には外径Ｄ１０ｍｍ、内径ｄ６ｍｍの円筒状をしたものを使用した。また、メタライズ層１５，５９を構成する金属には、銀、銅、チタンの合金を、ロウ材９には銅と銀を重量比で８：２の割合で含有してなる銀銅ロウを使用し、それぞれ９００℃の温度でロウ付け固定した。

【００４６】この結果、従来の給電構造を有する静電チャック５１では、給電端子５８とセラミック基体５２との間の熱膨張差に起因する熱応力が大きすぎるためにセラミック基体５２にクラックが発生したのに対し、図２及び図４に示す本発明の給電構造を有する静電チャック１においてはセラミック基体２の破損は見られなかった。

【００４７】（実施例２）次に、図１に示す静電チャック１のヒータ電極４に、図２に示す給電構造を用いて外径Ｄ／内径ｄ比が異なる円筒状の給電端子８をロウ付け固定し、該給電端子８に２ｋＷの電力を印加して、１００℃／分の急加熱を行う実験を行った。

【００４８】それぞれの結果は表１に示す通りである。

【００４９】

【表１】

給電端子の形状	外径Ｄ（mm）	内径ｄ（mm）	外径／内径	クラックの有無
円筒体	7	5	1．4	無し
	7	2	2．3	有り
	10	4	2．5	有り
	10	5	2．0	無し
	10	6	1．6	無し
	20	8	2．5	有り
	20	10	2．0	無し
	20	12	1．6	無し

【００５０】この結果、外径Ｄ／内径ｄ比が２より大きくなると円筒状の給電端子８を使用したとしても給電端子８とセラミック基体２との間の熱膨張差に起因する応力を緩和する効果が小さく、固定孔６ｂのコーナー部６３を起点とするクラックが発生した。

【００５１】これに対し、外径Ｄ／内径ｄ比が２より小さい範囲では急加熱を繰り返したとしてもセラミック基体２の破損は見られなかった。

【００５２】このことから、中空構造の給電端子８を用いる場合、外径Ｄ／内径ｄ比が２より小さい給電端子８を用いれば、加熱、冷却の繰り返しにおいてもセラミック基体２にクラックを生じることなく強固に固定できることが判る。

【００５３】

【発明の効果】以上のように、本発明によれば、セラミック基体の上面を保持面とし、内部に吸着用電極、ヒータ電極、高周波発生用電極などの内部電極を備えてなるウエハ保持装置の給電構造として、上記セラミック基体の裏面に給電端子を取り付けるための固定孔を前記電極を貫通して穿設し、その内壁にメタライズ層を形成するとともに、上記固定孔の内壁の側壁面又は底面のいずれか一方のみにロウ付けでもって給電端子を接合したことから、給電端子のロウ付け固定時におけるセラミック基体の破損を防ぐことができるとともに、ロウ付け固定後の内部応力を緩和することができるため、熱サイクルに伴う急加熱の繰り返しにおいてもセラミック基体を破損

させたり、内部電極の断線を生じることなく、強固に固定することができ、各電極に確実に通電することができる。

【図面の簡単な説明】

【図１】（ａ）は本発明に係る給電構造を有するウエハ保持装置の一例である静電チャック１を示す斜視図であり、（ｂ）は（ａ）のＸ－Ｘ線断面図である。

【図２】図１のＡ部を示す拡大図である。

【図３】（ａ）～（ｃ）は本発明に係る給電構造に用いるさまざまな形状を有する給電端子を示す斜視図である。

＊【図４】本発明に係る他の給電構造を示す拡大図である。

【図５】従来の静電チャックを示す縦断面図である。

【符号の説明】

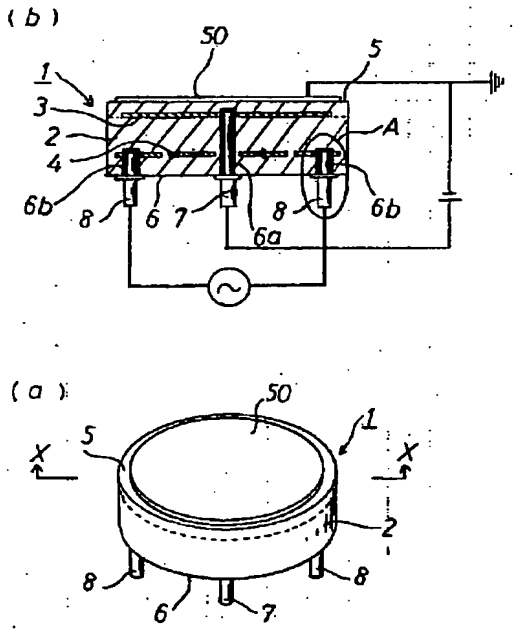
１…静電チャック　２…セラミック基体　３…吸着用電極　４…ヒータ電極

５…保持面　６…裏面　6a，6b…固定孔　61b …側壁面　62b …底面

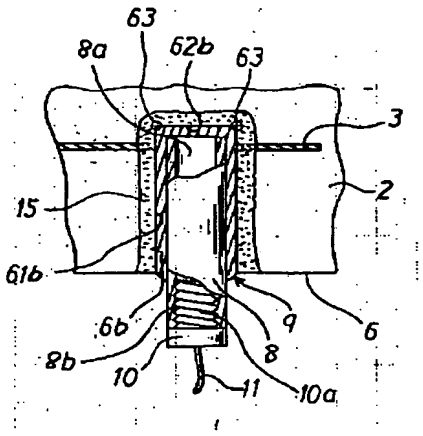
７，８…給電端子　９…ロウ材　10…取付金具　11…リード線

＊　15…メタライズ層　50…半導体ウエハ

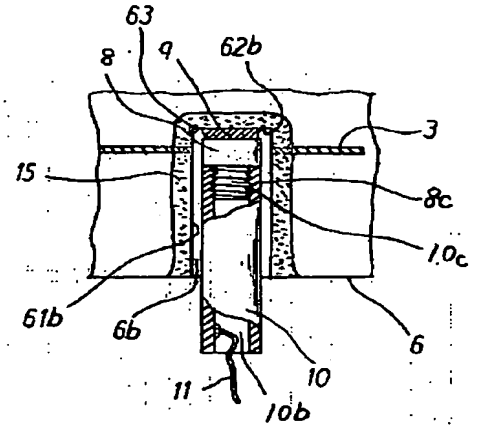
【図１】



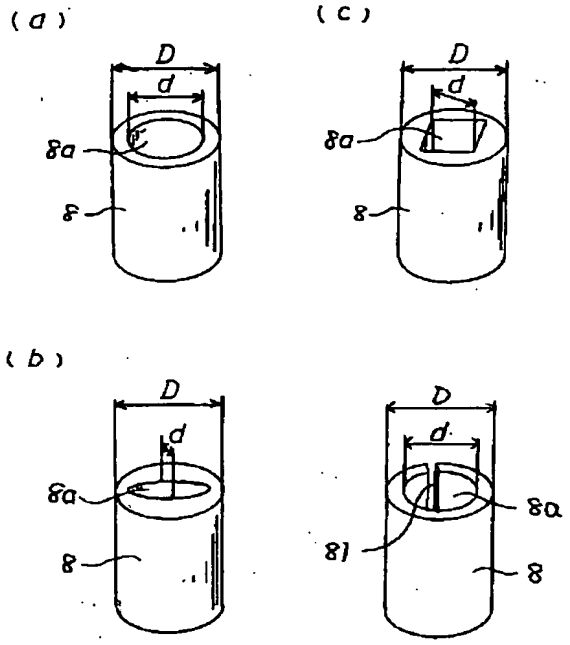
【図２】



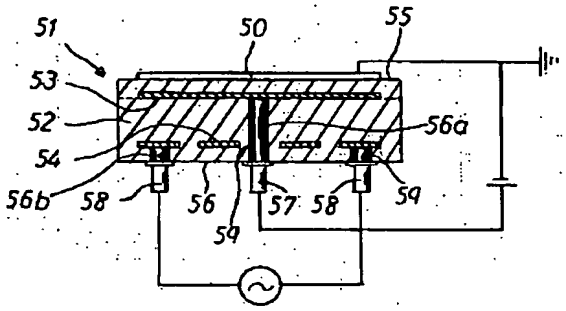
【図４】



【図３】



【図５】



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Electric-supply structure of the wafer supporting structure which makes the top face of a ceramic base a maintenance side, and comes to carry out low attachment immobilization of either and the electric-supply terminal of the side-attachment-wall side of the wall of the above-mentioned fixed hole, or a base while penetrating said electrode at the rear face of the above-mentioned ceramic base, drilling the fixed hole for attaching an electric-supply terminal in it in the wafer supporting structure which comes to prepare at least one electrode for the interior and forming a metallized layer in the wall.
[Claim 2] Electric supply structure of the wafer supporting structure according to claim 1 where the above-mentioned electric supply terminal has hollow structure.
[Claim 3] Electric supply structure of the wafer supporting structure according to claim 1 where the electrode with which the interior of the above-mentioned ceramic base is equipped is the electrode for adsorption, a heater electrode, or an electrode for RF generating.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the electric supply structure of the wafer supporting structure which equips the interior of ceramic bases, such as an electrostatic chuck, a heater built-in susceptor, etc. holding wafers, such as a semi-conductor wafer, with the electrode for adsorption, a heater electrode, or the electrode for RF generating.
[0002]
[Description of the Prior Art] Conventionally, in the production process of a semiconductor device, in order to hold a semi-conductor wafer (it is hereafter called a wafer for short) with high precision, the wafer supporting structure, such as an electrostatic chuck and a heater built-in susceptor, is used.
[0003] For example, as drawing of longitudinal section of the electrostatic chuck 51 was shown in drawing 5 , the top face of the ceramic base 52 was made into the maintenance side 55, and there were some which laid the heater electrode 54 underground for the electrode 53 for adsorption caudad above the interior, respectively. And a wafer 50 is laid in the maintenance side 55 of the above-mentioned electrostatic chuck 51, and while making the Coulomb force by dielectric polarization, and the Johnson Ra Bec force by the minute leakage current discover and carrying out adsorption maintenance of the wafer 50 in the maintenance side 55 by impressing an electrical potential difference between a wafer 50 and the electrode 53 for adsorption, a wafer 50 is heated by energizing to the heater electrode 54.
[0004] Moreover, the electric supply structure to internal electrodes laid under the above-mentioned ceramic base 52, such as the electrode 53 for adsorption, and the heater electrode 54 After puncturing so that the fixed holes 56a and 56b for attaching the electric supply terminals 57 and 58 in the rear face 56 of the ceramic base 52 may be opened for free passage with said internal electrodes 53 and 54, and forming a metallized layer 59 in the side-attachment-wall side of these fixed holes 56a and 56b, The electric supply terminals 57 and 58 whose outer diameters are about 3-10mm were inserted, and there were some which took the flow by carrying out low attachment immobilization with the fixed holes 56a and 56b and internal electrodes 53 and 54.
[0005]
[Problem(s) to be Solved by the Invention] However, the following technical problems occurred by the electrostatic chuck 51 with the above electric supply structures.
[0006] If low attachment immobilization of the electric supply terminals 57 and 58 which have the big cross section from it having to heat to an about 900-degree C elevated temperature is carried out at the fixed holes 56a and 56b of the ceramic base 52 when carrying out low attachment immobilization of the electric supply terminals 57 and 58 It originated in the differential thermal expansion between the electric supply terminals 57 and 58 and the ceramic base 52, and distortion remained to a part for a joint, and when sufficient design and verification were not made, there was a possibility that the ceramic base 52 might be damaged.
[0007] And the internal electrodes 53 and 54 laid under the ceramic substrate 52 had the technical problem that an open circuit of internal electrodes 53 and 54 was produced by repeat

fatigue, when heating and cooling were repeated impressing a several A to dozens of A current to the electric supply terminals 57 and 58 directly joined to internal electrodes 53 and 54, since thickness was several micrometers to dozens of micrometers, and a very thin metal membrane. In especially the thing in which the differential thermal expansion with a metal formed the ceramic base 52 by the aluminium nitride which is inferior in a mechanical strength a little greatly compared with other ceramics, these problems were remarkable.
[0008] moreover — carrying out caulking sticking by pressure of the internal electrodes 53 and 54 and the electric supply terminals 57 and 58 other than internal electrodes 53 and 54 as electric supply structure **** — the electric supply terminals 57 and 58 — burning — inserting in — the approach of fixing is also proposed — **** (refer to JP,4-104494,A) — caulking sticking by pressure — burning — inserting in — coming out — dispersion on manufacture was what lacks in dependability greatly.
[0009] In order to heat the electrostatic chuck 51 to an elevated temperature moreover, the high current needed to be impressed to the heater electrode 54, for that purpose, the big electric supply terminal 58 of the cross section had to be joined, the thermal stress in a part for a joint increased increasingly, and the risk of breakage was high.
[0010]
[Means for Solving the Problem] then, as electric supply structure of the wafer supporting structure which this invention makes the top face of a ceramic base a maintenance side in view of the above-mentioned technical problem, and comes to prepare at least one electrode of the electrode for adsorption, a heater electrode, and the electrode for RF generating for the interior While penetrating said electrode at the rear face of the above-mentioned ceramic base, drilling the fixed hole for attaching an electric supply terminal in it and forming a metallized layer in the wall, low attachment immobilization of either and the electric supply terminal of the side-attachment-wall side of the wall of the above-mentioned fixed hole or a base is carried out.
[0011]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained.
[0012] While the perspective view showing the electrostatic chuck 1 which is an example of the wafer supporting structure which has the electric supply structure concerning this invention, and (b) are X-X-ray sectional views of (a) and drawing 1 (a) makes the top face of the ceramic base 2 the maintenance side 5 The heater electrode 4 is caudad laid underground for the electrode 3 for adsorption above the interior, respectively, and the electric supply terminals 7 and 8 for energizing, respectively to the above-mentioned electrode 3 for adsorption and the heater electrode 4 are fixed to the rear face 6 of the ceramic base 2.
[0013] To the maintenance side 5 of the above-mentioned electrostatic chuck 1, and the semi-conductor wafer 50 Lay (it is hereafter called a wafer for short), and the Coulomb force by dielectric polarization and the Johnson Ra Bec force by the minute leakage current are made to discover by impressing an electrical potential difference between the above-mentioned electrodes 3 for adsorption. While a wafer 50 is made to learn from the flat precision of the maintenance side 5 and carries out adsorption maintenance, the wafer 50 is heated to homogeneity by impressing an electrical potential difference to the heater electrode 4.
[0014] What is necessary is just to adopt ceramics, such as an alumina, aluminium nitride, silicon nitride, silicon carbide, barium titanate, titanic-acid calcium, an yttrium aluminum garnet, and yttria, as a ceramic base 2 which constitutes such an electrostatic chuck 1. Also in this, since especially aluminium nitride has the corrosion resistance which was excellent to the halogen system corrosive gas currently used at the membrane formation process or the etching process, it is suitable to constitute the electrostatic chuck 1, while it heats immediately the wafer 50 which carried out adsorption maintenance to desired temperature in the maintenance side 5, and it can heat it to homogeneity, without producing heating nonuniformity, since it has thermal conductivity high also in the ceramics.
[0015] In addition, in order that the maintenance side 5 of the above-mentioned electrostatic chuck 1 may carry out adsorption maintenance, without making a wafer 50 distorted, the very flat field 10 micrometers or less is made to display flatness.
[0016] by the way, as electric supply structure to internal electrodes laid under the ceramic base

2, such as the electrode 3 for adsorption, and the heater electrode 4 What is necessary is just to carry out low attachment immobilization of the electric supply terminals 7 and 8 with either the side-attachment-wall side of the wall of the fixed holes 6a and 6b, or a base, while penetrating said internal electrodes 3 and 4 at the rear face 6 of the ceramic base 2 and drilling the fixed holes 6a and 6b for attaching the electric supply terminals 7 and 8 in it.
[0017] Hereafter, the detail of the electric supply structure to internal electrodes 3 and 4 is explained taking the case of the electric supply structure to the heater electrode 4.
[0018] Drawing 2 is the enlarged drawing showing the A section of drawing 1 , and it has formed the metallized layer 15 in side-attachment-wall side 61b and base 62b containing the above-mentioned electrode 3 for adsorption of fixed hole 6b while it penetrates the heater electrode 4 and drills fixed hole 6b for attaching the electric supply terminal 8 in the rear face 6 of the ceramic base 2. In addition, there should just be about dozens of micrometers as a bed depth of a metallized layer 15.
[0019] And although low attachment immobilization is carried out by inserting the electric supply terminal 8 and heating in a predetermined elevated-temperature ambient atmosphere, applying the low material 9 to side-attachment-wall side 61of above-mentioned fixed hole 6b b, the above-mentioned electric supply terminal 8 fixes the electric supply terminal 8 of the hollow structure which had inner hole 8a in the interior.
[0020] namely, from it being necessary to heat the electric supply terminal 8 at an about 900-degree C elevated temperature to carry out low attachment immobilization Although stress will concentrate on the corner section 63 of fixed hole 6b and a crack will occur to the shaft orientations and the shaft of the electric supply terminal 8 since the differential thermal expansion between the ceramic bases 2 in a perpendicular direction is too large if the electric supply terminal 8 of the solid structure where it does not have the inner hole is used This invention carries out low attachment immobilization using the electric supply terminal 8 of hollow structure only with side-attachment-wall side 61of fixed hole 6b b. Since a low attachment area with base 62b is reduced, while easing the stress of a direction perpendicular to the shaft orientations of the electric supply terminal 8 and controlling the stress concentration in the corner section 63 of fixed hole 6b A metallized layer 15 is formed in side-attachment-wall side 61of fixed hole 6b b, since the low material 9 is made easy to distribute, the stress accompanying a differential thermal expansion can be absorbed and breakage of the ceramic base 2 can be prevented.
[0021] And since fixed hole 6b which fixes the electric supply terminal 8 forms a metallized layer 15 in side-attachment-wall side 61of fixed hole 6b which penetrates and drills heater electrode 4 of thin meat, and contains above-mentioned heater electrode 4 b and enables it to have taken the heater electrode 4 and the flow, it can be energized certainly, without producing an open circuit of the heater electrode 4, even if it impresses a big electrical potential difference, in order to heat the electrostatic chuck 1 to an elevated temperature.
[0022] Thus, while according to this invention penetrating the heater electrode 4, forming fixed hole 6b and forming a metallized layer 15 in the side-attachment-wall side 61b and base 62b From having considered as the structure which carries out low attachment immobilization of the electric supply terminal 8 of hollow structure, and carries out low attachment immobilization only with side-attachment-wall side 61of fixed hole 6b b The ceramic base 2 is not damaged in heating at the time of low attachment immobilization, and an open circuit of the heater electrode 4 and breakage of the ceramic base 2 are not produced in the repeat of heating by the energization to the heater electrode 4, and cooling.
[0023] By the way, it does not necessarily need to penetrate that what is necessary is just things which have inner hole 8a in the point of the electric supply terminal 8 at least, such as what has inner hole 8a which carried out the polygon of the thing to which the cross-section configuration as shown in drawing 3 R> 3 (a) - (c) carried out the round shape and the ellipse form, or a square, in the electric supply terminal 8 of hollow structure. Furthermore, as shown in drawing 3 (d), stress can be further eased by forming a slit 81 in the electric supply terminal 8 which carried out the shape of a cylinder. Moreover, it does not matter even if it carries out the thing, ellipse, and prism which carried out the shape of a cylinder also in the shape of an

appearance of the electric supply terminal 8.
[0024] In addition, what has the rate of the maximum outer diameter D to a bore d in two or less range as a desirable dimension of the electric supply terminal 8 is good.
[0025] This is because the thickness in the point of the electric supply terminal 8 becomes thick too much, so it becomes impossible to fully absorb the stress generated in the corner section 63 of fixed hole 6b if the rate of an outer diameter D to a bore d becomes larger than 2.
[0026] However, the bore d of the electric supply terminal 8 is the die length of the shortest part of inner hole 8a, and an outer diameter D is the die length of the longest part in the periphery section.
[0027] Furthermore, if a reverse R-like meniscus is formed between the rear face 6 of the ceramic base 2, and the electric supply terminal 8, the stress concentration resulting from a differential thermal expansion is further absorbable.
[0028] In addition, lead wire 11 may be directly joined to inner hole 8a of the electric supply terminal 8 that connection of the above-mentioned electric supply terminal 8 and lead wire 11 prepares female screw section 8b in the back end section of inner hole 8a of the electric supply terminal 8, screws the fixing metal 10 with male screw 10a which connected lead wire 11 to this female screw section 8b, and should just energize it as shown in drawing 2 .
[0029] Next, other electric supply structures to the heater electrode 4 are explained.
[0030] Drawing 4 is the enlarged drawing showing other electric supply structures to the heater electrode 4 like drawing 2 , and it has formed the metallized layer 15 in side-attachment-wall side 61b and base 62b containing the above-mentioned heater electrode 4 of fixed hole 6b while it penetrates the heater electrode 4 and drills fixed hole 6b for attaching the electric supply terminal 8 in the rear face 6 of the ceramic base 2. In addition, there should just be about dozens of micrometers as a bed depth of a metallized layer 15.
[0031] And the low material 9 is applied only to base 62of above-mentioned fixed hole 6b b, and low attachment immobilization of the electric supply terminal 8 is carried out.
[0032] Thus, if low attachment immobilization is carried out only at base 62of apical surface [of the electric supply terminal 8], and fixed hole 6b b, since the stress of the shaft orientations of the electric supply terminal 8 accompanying a differential thermal expansion will become that there is nothing, the stress concentration in the corner section 63 of fixed hole 6b can be controlled, and breakage of the ceramic base 2 can be prevented.
[0033] And while fixed hole 6b which fixes the electric supply terminal 8 penetrates and drills the heater electrode 4 of thin meat From forming a metallized layer 15 in side-attachment-wall side 61of fixed hole 6b b and base 62b containing the above-mentioned heater electrode 4, and enabling it to have taken the heater electrode 4 and the flow It can energize certainly, without producing an open circuit of the heater electrode 4, even if it impresses a big electrical potential difference, in order to heat the electrostatic chuck 1 to an elevated temperature.
[0034] In addition, such structure, then the electric supply terminal 8 may be the things of solid structure, as shown in hollow structure drawing 4 . Moreover, what is necessary is for connection of the above-mentioned electric supply terminal 8 and lead wire 11 to screw female screw 10c formed in inner hole 10b of the fixing metal 10 of the shape of a cylinder which joined lead wire 11 to male screw 8c of the electric supply terminal 8, and just to make it take a flow, as shown in drawing 4 .
[0035] Moreover, although drawing 4 showed the example which carried out low attachment immobilization only to base 62of apical surface [of the electric supply terminal 8], and fixed hole 6b b On the contrary, since low attachment immobilization may be carried out and the stress of a perpendicular direction becomes that there is nothing in this case only at side-attachment-wall side 61of peripheral face [of the electric supply terminal 8], and fixed hole 6b b to the shaft orientations of the electric supply terminal 8 accompanying a differential thermal expansion The stress concentration in the corner section 63 of fixed hole 6b can be controlled like the electric supply structure shown in drawing 4 , and breakage of the ceramic base 2 can be prevented.
[0036] After penetrating the heater electrode 4, drilling fixed hole 6b and forming a metallized layer 15 in the side-attachment-wall side 61b and base 62b like the electric supply structure

shown in these drawing 2 and drawing 4 , breakage of the ceramic base 2 and an open circuit of the heater electrode 4 are not produced at the structure which carries out low attachment immobilization of the electric supply terminal 8, then the time of junction and use in either above-mentioned side-attachment-wall side 61b or base 62b.
[0037] However, that what is necessary is just to have formed in side-attachment-wall side 61b at least, the metallized layer 15 formed in fixed hole 6b should just form a metallized layer 15 also in base 62b, when carrying out low attachment of the electric supply terminal 8 at base 62b.

[0038] In addition, in the electric supply structure concerning this invention, while having high thermal resistance as the quality of the material of the electric supply terminal 8 for energizing to the heater electrode 4, what was approximated to the coefficient of thermal expansion of the ceramic base 2 is good, for example, should just form with metals, such as a tungsten, molybdenum, a tantalum, and covar. Since the coefficient of thermal expansion approximates these metals with 3x10-6 - 7x10-6/degree C and the coefficient of thermal expansion (3x10-6 - 7.8x10-6/degree C) of the ceramic base 2 while they are usable also under an about 500-degree C elevated temperature, they can mitigate the stress which joins the ceramic base 2.
[0039] Moreover, although explained taking the case of the electric supply structure to the heater electrode 4 in drawing 2 or drawing 4 , in order to also have made electric supply structure to the electrode 3 for adsorption in the electrostatic chuck 1 of drawing 1 into the same structure and to acquire adsorption power greatly not to mention the time of junction of the electric supply terminal 7, even if it impresses a big electrical potential difference to the electrode 3 for adsorption, breakage of the ceramic base 2 and an open circuit of the electrode 3 for adsorption are not produced.
[0040] Furthermore, what is necessary is to lay the electrode for RF generating underground and just to use further, the same electric supply structure as the heater electrode 4 which also shows the electric supply structure to this electrode to drawing 2 , although the example which laid the electrode 3 for adsorption and the heater electrode 4 under the interior of the ceramic base 2 was shown in drawing 1 .
[0041] As mentioned above, although drawing 1 explained taking the case of the electrostatic chuck 1, it cannot be overemphasized that this invention is applicable also to the wafer supporting structure which builds an electrode in the interior of the ceramic bases 2, such as a susceptor which built in the heater electrode and the electrode for RF generating.
[0042]
[Example]
(Example 1) Here, the electrostatic chuck 1 of drawing 1 using the electric supply structure of this invention shown in drawing 2 and drawing 4 and the electrostatic chuck 51 of drawing 5 using the conventional electric supply structure were made as an experiment, and the junction experiment of the electric supply terminals 7, 8, 57, and 58 was conducted.
[0043] First, the electrostatic chucks 1 and 51 used in this experiment carried out addition mixing only of a binder and the solvent at the AlN powder which is 99.9% of purity whose mean particle diameter is about 1.2 micrometers, manufactured slurry, and fabricated two or more green sheets with a thickness of about 0.4mm with the doctor blade method. Among these, the metal paste film which lays that it is also with a screen printer about the paste of the tungsten (W) which mixed AlN powder with the green sheet of two sheets, and forms the electrodes 3 and 53 for adsorption, and the metal paste film which forms the heater electrodes 4 and 54 were formed in each. The laminating of the green sheet which laid each metal paste film, and the remaining green sheets is carried out. And 80-degreeC, 50kg/cm2 After carrying out thermocompression bonding by the pressure and forming a green sheet layered product, perform cutting and it considers as disc-like. Vacuum cleaning of this disc-like green sheet layered product is carried out, and it calcinates at the temperature of about 2000 degrees C in a vacuum ambient atmosphere the appropriate back for 5 hours. With the outer diameter of 200mm, and the thickness of 10mm And it manufactured by forming in the interior the ceramic bases 2 and 52 equipped with the electrodes 3 and 53 for adsorption and the heater electrodes 4 and 54 of about 15 micrometers of thickness, respectively, performing polish processing to the front face

of the near ceramic bases 2 and 52 under which the electrodes 3 and 53 for adsorption are laid, and forming the maintenance side 5 in it.
[0044] And after drilling the fixed holes 6a and 6b which penetrate said electrode 3 for adsorption, and the heater electrode 4 in the rear face 6 of the electrostatic chuck 1 as a thing of this invention, respectively and forming a metallized layer 15 in this side-attachment-wall side 61b and base 62b, Low attachment immobilization of the electric supply terminals 7 and 8 which consist of molybdenum using drawing 2 and the electric supply structure of drawing 4 is carried out. As an example of a comparison It punctures so that the fixed holes 56a and 56b for attaching the electric supply terminals 57 and 58 in the rear face 56 of the electrostatic chuck 51 may be opened for free passage without penetrating said internal electrodes 53 and 54. After forming a metallized layer 59 in the side-attachment-wall side of these fixed holes 56a and 56b, low attachment immobilization of the electric supply terminals 7 and 8 which consist of molybdenum was carried out.
[0045] In addition, each dimension of the electric supply terminals 7 and 8 used what carried out the shape of a cylinder of outer-diameter D10mm, and used what carried out the shape of a cylinder (outer-diameter D10mm and bore d6mm) for the electric supply terminals 7 and 8 used for the electric supply structure of drawing 2 . moreover, the silver copper low which 8:2 comes the alloy of silver, copper, and titanium out of copper and silver comparatively by the weight ratio at the low material 9, and it comes to contain was used for the metal which constitutes metallized layers 15 and 59, and low attachment immobilization was carried out at the temperature of 900 degrees C, respectively.
[0046] Consequently, by the electrostatic chuck 51 which has the conventional electric supply structure, since the thermal stress resulting from the differential thermal expansion between the electric supply terminal 58 and the ceramic base 52 was too large, breakage of the ceramic base 2 was not seen in the electrostatic chuck 1 which has the electric supply structure of this invention shown in the ceramic base 52 to the crack having occurred at drawing 2 and drawing 4 .
[0047] (Example 2) Next, low attachment immobilization of the cylinder-like electric supply terminal 8 with which outer-diameter D differs from a bore d ratio using the electric supply structure shown in the heater electrode 4 of the electrostatic chuck 1 shown in drawing 1 at drawing 2 was carried out, 2kW power was impressed to this electric supply terminal 8, and the experiment which performs sudden 100-degree-C heating for /was conducted.
[0048] Each result is as being shown in Table 1.
[0049]
[Table 1]

給電端子の形状	外径D (mm)	内径d (mm)	外径/内径	クラックの有無
円筒体	7	5	1.4	無し
	7	2	2.3	有り
	10	4	2.5	有り
	10	5	2.0	無し
	10	6	1.6	無し
	20	8	2.5	有り
	20	10	2.0	無し
	20	12	1.6	無し

[0050] Consequently, when outer-diameter D / bore d ratio became larger than 2, even if it used the cylinder-like electric supply terminal 8, the effectiveness which eases the stress resulting from the differential thermal expansion between the electric supply terminal 8 and the ceramic base 2 was small, and the crack on the basis of the corner section 63 of fixed hole 6b occurred.
[0051] On the other hand, in the range where outer-diameter D / bore d ratio is smaller than 2, even if it repeated sudden heating, breakage of the ceramic base 2 was not seen.
[0052] It turns out that it is firmly fixable, without producing a crack from this in the ceramic base 2 also in the repeat of heating and cooling, if outer-diameter D / bore d ratio uses the electric supply terminal 8 smaller than 2 when using the electric supply terminal 8 of hollow structure.
[0053]
[Effect of the Invention] as mentioned above, according to this invention, as electric supply structure of the wafer supporting structure which makes the top face of a ceramic base a maintenance side, and comes to prepare internal electrodes, such as an electrode for adsorption, a heater electrode, and an electrode for RF generating, for the interior While penetrating said electrode at the rear face of the above-mentioned ceramic base, drilling the fixed hole for attaching an electric supply terminal in it and forming a metallized layer in the wall Since the electric supply terminal was joined as low attachment is also in either the side-attachment-wall side of the wall of the above-mentioned fixed hole, or a base, while being able to prevent breakage of the ceramic base at the time of low attachment immobilization of an electric supply terminal Without damaging a ceramic base or producing an open circuit of an internal electrode also in the repeat of sudden heating accompanying a heat cycle, since the internal stress after low attachment immobilization can be eased, it can fix firmly and can energize certainly to each electrode.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] (a) is the perspective view showing the electrostatic chuck 1 which is an example of the wafer supporting structure which has the electric supply structure concerning this invention, and (b) is X-X-ray sectional view of (a).
[Drawing 2] It is the enlarged drawing showing the A section of drawing 1 .
[Drawing 3] (a) - (c) is the perspective view showing the electric supply terminal which has various configurations used for the electric supply structure concerning this invention.
[Drawing 4] It is the enlarged drawing showing other electric supply structures concerning this invention.
[Drawing 5] It is drawing of longitudinal section showing the conventional electrostatic chuck.
[Description of Notations]
1 -- Electrostatic chuck 2 -- Ceramic base 3 -- Electrode for adsorption 4 -- Heater electrode

5 -- Maintenance side 6 -- Rear face 6a, 6b -- Fixed hole 61b -- Side-attachment-wall side 62b -- Base
7 Eight -- Electric supply terminal 9 -- Low material 10 -- Fixing metal 11 -- Lead wire
15 -- Metallized layer 50 -- Semi-conductor wafer

[Translation done.]